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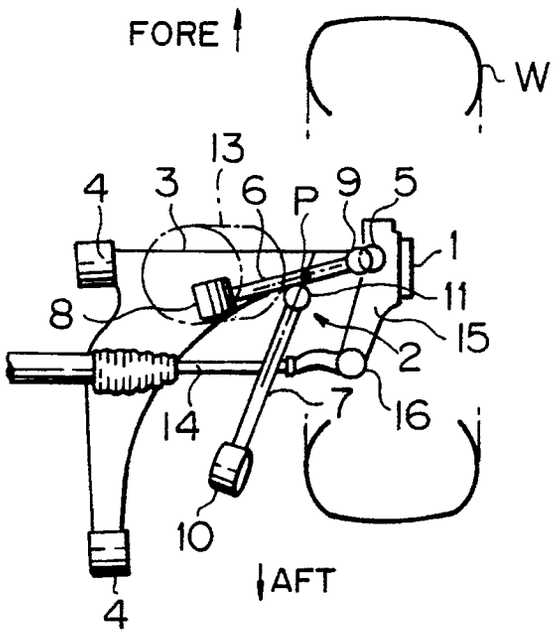
(54) Suspension system of a vehicle.

(57) A suspension system for a vehicle comprises a steering knuckle (1) supporting a wheel which is used for steering, a lower arm (3) for connecting a lower portion of the steering knuckle to the frame of the vehicle, two link members (6,7), pivotally connected to the frame of the vehicle at one end and to the steering knuckle at the opposite end, said link members (6,7) being so disposed as to set a kingpin offset (δ) at a positive value wherein the cross point between the kingpin axis and the ground is located inside of the center of the contact surface between the wheel and the ground in relation to the transverse direction of the vehicle, and increase the kingpin offset as the wheel is turned in a direction wherein the wheel is located radially outwardly in relation to the turning circle.

FIG. 1



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BACKGROUND OF THE INVENTION

1. Field of the invention

The present invention relates to a suspension system for anchoring wheels used for steering to a frame of a vehicle.

2. Description of the prior art

Hereinafter, a fore to aft direction of the vehicle is called a longitudinal direction, and a side to side direction of the vehicle is called a transverse direction. Also, a location near to a centerline of the vehicle is called inside, and a location distant from a centerline of the vehicle is called outside.

There has been known a double pivot type suspension system for a vehicle. For example, Japanese Utility Model Laid-Open Publication No. 64-26507 shows such a type of suspension system. This type of suspension system comprises a steering knuckle for supporting a wheel, and an upper arm and a lower arm respectively connecting an upper portion and a lower portion of the steering knuckle to a frame of a vehicle. At least one of the arms comprises two link members, each of which is pivotally connected to the frame at a respective one end thereof, and to the steering knuckle at a respective opposite end thereof.

In this type of suspension system, a kingpin axis, which is an axis around which a wheel used for steering is turned, extends through a cross point between the axis of the two link members. The kingpin axis moves in response to the movement of the cross point in a horizontal plane during steering of the vehicle. As a result, a kingpin offset, which is a transverse distance between the kingpin axis and a center of a contact surface between the wheel and the ground, varies as the kingpin axis moves.

SUMMARY OF THE INVENTION

It is therefore the object of the present invention to provide a double pivot type suspension system for a vehicle wherein the vehicle is stabilized against braking during turning by using the variation of the kingpin offset during steering of the vehicle.

In accordance with the present invention, there is provided a suspension system for a vehicle which comprises a steering knuckle for supporting a wheel which is used for steering, an upper arm for connecting an upper portion of the steering knuckle to a frame of the vehicle, and a lower arm for connecting a lower portion of the steering knuckle to the frame of the vehicle, at least one of said arms comprising two link members, each of said link members being pivotally connected to the frame of the vehicle at one end thereof and to the steering knuckle at an opposite end thereof, said link members being so disposed as to set a kingpin offset at a positive value wherein a cross point between the kingpin axis and the ground is located inside of the center of a contact surface between the wheel and the ground in relation to a transverse direction of the vehicle, and increase the kingpin offset as the wheel is turned toward an outward direction wherein the wheel is located radially outwardly in relation to a turning circle.

In a preferable aspect of the present invention, there is provided a suspension system for a vehicle which comprises a steering knuckle for supporting a wheel which is used for steering, an upper arm for connecting an upper portion of the steering knuckle to a frame of the vehicle, and a lower arm for connecting a lower portion of the steering knuckle to the frame of the vehicle, at least one of said arms comprising two link members, each of said link members being pivotally connected to the frame of the vehicle at one end thereof and to the steering knuckle at an opposite end thereof, said link members being so disposed as to set a kingpin offset at a positive value wherein a cross point between the kingpin axis and the ground is located inside of the center of a contact surface between the wheel and the ground in relation to a transverse direction of the vehicle, and increase the kingpin offset as the wheel is turned toward an inward direction wherein the wheel is located radially inwardly in relation to a turning circle as well as an outward direction wherein the wheel is located radially outwardly in relation to the turning circle.

In a preferable aspect of the present invention, there is provided a suspension system for a vehicle which comprises a steering knuckle for supporting a wheel which is used for steering, an upper arm for connecting an upper portion of the steering knuckle to a frame of the vehicle, and a lower arm for connecting a lower portion of the steering knuckle to the frame of the vehicle, at least one of said arms comprising two link members, each of said link members being pivotally connected to the frame of the vehicle at one end thereof and to the steering knuckle at an opposite end thereof, said link members being so disposed as to set a kingpin offset at a positive value wherein a cross point between the kingpin axis and the ground is located inside of the center of a contact surface between the wheel and the ground in relation to a transverse direction of the vehicle, and minimize the kingpin offset when the wheel is turned at a predetermined angle toward an inward direction wherein the wheel is located radially inwardly in relation to a turning circle.

According to the features of the present inven-

tion, the two link members are so disposed as to set a kingpin offset at a positive value wherein a cross point between the kingpin axis and the ground is located inside of the center of a contact surface between the wheel and the ground in relation to a transverse direction of the vehicle, and increase the kingpin offset as the wheel is turned toward an outward direction wherein the wheel is located radially outwardly in relation to a turning circle from the neutral position of the wheel. Thus, when the vehicle is braked during the turning of the same, a momentum due to a drag force working at the center of the contact surface between the wheel and the grcund, which rotates the wheel being turned toward the outward direction opposite to the turning direction around the kingpin axis, increases as the wheel is turned to the turning direction, so that excessive turning of the vehicle is restricted, and the safety of the vehicle is enhanced.

The safety of the vehicle is much more enhanced if the two link members are so disposed as to set a kingpin offset at a positive value wherein a cross point between the kingpin axis and the ground is located inside of the center of a contact surface between the wheel and the ground in relation to a transverse direction of the vehicle, and minimize the kingpin offset when the wheel is turned at a predetermined angle toward an inward direction wherein the wheel is located radially inwardly in relation to a turning circle. In this case, as the kingpin offset is minimized when the wheel is turned toward an inward direction from a neutral position, the kingpin offset increases rapidly when the wheel is turned toward the outward direction from the neutral position, so that excessive turning of the vehicle is remarkably restricted, and the safety of the vehicle is still more enhanced.

The above and other objects and features of the present invention will become apparant from the following description of the preferred embodiments when taken in conjunction with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a plan view of a suspension system in accordance with a first embodiment of the present invention.

Figure 2 is a front view of a suspension system in accordance with the first embodiment of the present invention.

Figure 3 is a schematic perspective view showing a general arrangement of the suspension system of the first embodiment of the present invention.

Figure 4 is a schematic plan view of the arrangement of Figure 3.

Figure 5 is a diagram showing variations in a kingpin offset.

Figure 6 is a schematic plan view of a general arrangement of a suspension system of a second embodiment of the present invention.

Figure 7 is a schematic plan view of a general arrangement of a suspension system of a third embodiment of the present invention.

Figure 8 is a schematic plan view of a general arrangement of a suspension system of a fourth embodiment of the present invention.

DESCRIPTION OF THE PREFERED EMBODIMENTS

Referring to Figures 1 to 3, there is shown a suspension system according to a first embodiment of the present invention. The suspension system is for anchoring a right front wheel W, which is used for steering and also for driving, of a FF (front-engine-front-drive) vehicle, to the frame of the vehicle.

In Figures 1 to 3, a steering knuckle 1 supporting the wheel W is connected to and supported by the frame of the vehicle (not shown) at an upper portion thereof through an upper arm 2, while being connected to and supported by the frame of the vehicle (not shown) at a lower portion thereof through a lower arm 3. The lower arm 3 has an A shaped configuration. Two end points of the A shaped lower arm 3 are aligned in substantially a longitudinal direction of the vehicle, and respectively connected to and supported by the frame of the vehicle for vertical pivotal motion through rubber bushings 4, 4. The apex of the A shaped lower arm 3 is rotatably connected to the steering knuckle 1 through a ball joint 5.

The upper arm 2 comprises two link members 6, 7. The link member 6 is disposed in substantially a transverse direction of the vehicle. The link member 6 is connected to the frame of the vehicle through a rubber bush 8 at one end thereof and pivotally connected to the steering knuckle 1 through a ball joint 9 at an opposite end thereof. The link member 7 is disposed above the link member 6 and in substantially a longitudinal direction of the vehicle. The link member 7 is connected to the frame of the vehicle through a rubber bush 10 at one end thereof and pivotally connected to the steering knuckle 1 through a ball joint 11 at an opposite end thereof. As shown in Figure 1, in a plan view, the link member 7 is disposed such that its axis, when extended, crosses an axis of the link member 6 at point P on the axis of the link member 7. More over, the link member 7 is located to the rear of the cross point P in relation to the longitudinal direction of the vehicle. Though not shown in Figure 1, the rubber bushes 8, 10 respec-

tively comprise an inner cylinder, an outer cylinder and a rubber placed into a space between the two cylinders. Thus, the link members 6, 7 can pivot horizontally within a limited angle determined by the resiliency of the rubber bushes 8, 10, and they can rotate around the axes of the rubber bushes 8, 10, that is they can pivot upward and downward.

In Figure 1, there is also shown a drive shaft 12 and a shock absorber 13. The shock absorber 13 is connected to the lower arm 3 at a lower end thereof and to the frame of the vehicle at an upper end thereof. A tie rod 14 of the steering system is connected to a steering arm 15 protruding from the steering knuckle 1 through a ball joint 16. Thus, under a steering force provided through the tie rod 14, the front wheel W, integrally with the steering knuckle 1, turns around a kingpin axis KL.

The kingpin axis KL extends from a cross point between the lower arm 3 and the steering knuckle 1, ie., the center of the ball joint 5, to the point P on the axis of the link member 7 where, in a plan view, the axis of the link member 6 and the axis of the link member 7 cross each other. A kingpin offset δ which is the transverse distance between the kingpin axis KL and the center of a contact surface between the front wheel W and the ground, ie., a cross point between a center line CL of the front wheel W and the ground, is set at a positive value, that is a cross point between the kingpin axis KL and the ground is located inside of the cross point between the center line CL of the front wheel W and the ground in relation to the transverse direction of the vehicle. The kingpin offset δ varies as the cross point P moves in response to the turning of the front wheel W.

The movement of the cross point P in response to the turning of the front wheel W will be described hereinafter with reference to Figure 4. In Figure 4, the link members 6, 7 are indicated by solid lines when the front wheel W is in the neutral position, by dashed lines when the front wheel W is turned in a direction wherein the wheel W is positioned radially outwardly in relation to a turning circle of the vehicle, that is the front wheel W is turned so as to turn the vehicle to the left in this embodiment, hereinafter said direction bing called an outward direction, by two-dot chain lines when the front wheel W is turned in a direction wherein the wheel W is positioned radially inwardly in relation to a turning circle of the vehicle, that is the front wheel W is turned so as to turn the vehicle to the right in this embodiment, hereinafter said direction being called an inward direction, and by broken lines when the front wheel W is excessively turned to the inward direction.

As understood from Figure 4, the link members 6, 7 of the upper arm 2 horizontally pivot around their respective connection points to the frame of the vehicle, ie., the rubber bushes 8, 10, in response to the turning of the front wheel W. Thus the cross point P between the link members 6 and 7 moves along the axis of the link member 6. More specifically, when the front wheel W is turned to the outward direction from the neutral position, the cross point P moves to the outside of the vehicle along the link member 6 (P_0 to P_1). When the front wheel W is turned to the inward direction from the neutral position, the cross point P moves to the inside of the vehicle along the link member 6 (P_0 to P_2). But this movement of the cross point P to the inside of the vehicle ceases when the cross point P overlaps the connection point of the link member 7 with the steering knuckle 1, ie., the ball joint 11. When the front wheel W is still further turned to the inward direction, the cross point P moves to the outside along the link member 6 (P_2 to P_3). Thus, the kingpin offset δ , as denoted by a line A in Figure 1, is within a positive value wherein the cross point between the kingpin axis KL and the ground lies inside of the cross point between the centerline CL of the front wheel W and the ground in relation to the transverse direction of the vehicle. The kingpin offset δ becomes a minimum when the front wheel W is turned to the inward direction to such an extent that the cross point P overlaps the connection point of the link member 7 with the steering knuckle 1, ie., the ball joint 11. When the front wheel W is still further turned to the inward direction, or when the front wheel W is turned to the outward direction, the kingpin offsetδ increases substantially at a quadratic curve.

As described above, link members 6, 7 are so disposed as to set the kingpin offsetδ at a positive value and increase the kingpin offsetδ when the front wheel W is turned to the outwrad direction from the neutral position. Thus, when the vehicle is braked during the turning of the same, a momentum due to a drag force working on the center of the contact surface between the front wheel W and the ground, which rotates the front wheel W being turned to the outward direction opposite to the turning direction around the kingpin axis KL, increases as the front wheel W is turned to the turning direction, so that excessive turning of the vehicle is restricted when it is braked during the turning of the same, and the safety of the vehicle is enhanced.

In this embodiment, as the kingpin offset δ is minimized when the front wheel W is turned to the inward direction from the neutral position, the kingpin offset δ increases rapidly when the front wheel W is turned to the outward direction from the neutral position, so that excessive turning of the vehicle is remarkably restricted, and the safety of the vehicle is still more enhanced.

Figure 6 shows a second embodiment of the

present invention. In this embodiment, the link member 6 is disposed transversely, and the link member 7 is disposed longitudinally. As shown in Figure 6, in a plan view, the link member 6 is disposed such that its axis, when extended to the outside, crosses an axis of the link member 7 at point P on the axis of the link member 7. More over, the link member 7 is located in front of the cross point P in relation to the longitudinal direction of the vehicle.

When the front wheel W is turned from the neutral position to the outward direction, the cross point P moves along the axis of the link member 7. The link member 7 pivots to the outside of the vehicle around the connection point thereof with the frame of the vehicle, ie., the rubber bush 10, when the front wheel W is turned from the neutral position to the outward direction, and pivots to the inside of the vehicle when the front wheel W is turned from the neutral position to the inward direction. Thus, the cross point P moves to the outside of the vehicle when the front wheel W is turned from the neutral position to the outward direction (P_0 to P_1), while it moves to the inside of the vehicle when the front wheel W is turned from the neutral position to the inward direction (P_0 to P_2). But, if the front wheel W is turned to the inward direction so as to exceed the position where the cross point P overlaps the connection point of the link member 6 with the steering knuckle 1, ie., the ball joint 9, the cross point P moves to the outside.

As a result, the same as in the first embodiment, the kingpin offset δ , as denoted by a line A in Figure 5, is within a positive value wherein the cross point between the kingpin axis KL and the ground lies inside of the cross point between the centerline CL of the front wheel W and the ground in relation to the transverse direction of the vehicle. The kingpin offset δ is minimized when the front wheel W is turned to the inward direction to such an extent that the cross point P overlaps the connection point of the link member 6 with the steering knuckle 1, ie., the ball joint 9. When the front wheel W is still further turned to the inward direction, or when the front wheel W is turned to the outward direction, the kingpin offset δ increases substantially at a quadratic curve. Thus, excessive turning of the vehicle is restricted when it is braked during the turning of the same, and the safety of the vehicle is enhanced.

Figure 7 shows a third embodiment of the present invention. In this embodiment, the link member 6 is disposed transversely, and the link member 7 is disposed longitudinally and obliquely. As shown in Figure 7, in a plan view, the link members 6 and 7 are disposed such that their axes, when extended to the outside of the vehicle, cross each other. More over, the link member 7 is located to the rear of the cross point P in relation to the loingitudinal direction of the vehicle.

Thus, the cross point P moves to the outside of the vehicle when the front wheel W is turned from the neutral position to the outward direction (P_0 to P_1), while it moves to the inside of the vehicle when the front wheel W is turned from the neutral position to the inward direction (P_0 to P_2). But, if the front wheel W is turned to the inward direction so as to exceed the position where the cross point P overlaps the connection point of the link member 6 with the steering knuckle 1, ie., the ball joint 9, the cross point P moves to the outside.

As a result, the same as in the first embodiment, the kingpin offset δ , as denoted by a line A in Figure 5, is within a positive value wherein the cross point between the kingpin axis KL and the ground lies inside of the cross point between the centerline CL of the front wheel W and the ground in relation to the transverse direction of the vehicle. The kingpin offset δ is minimized when the front wheel W is turned to the inward direction to such an extent that the cross point P overlaps the connection point of the link member 6 with the steering knuckle 1, ie., the ball joint 9. When the front wheel W is still further turned to the inward direction, or when the front wheel W is turned to the outward direction, the kingpin offset δ increases substantially at a quadratic curve.

Figure 8 shows a fourth embodiment of the present invention. In this embodiment, the disposition of the link members 6 and 7 is almost the same as in the first embodiment. But in this embodiment, when the front wheel W is in the neutral position, the connection point of the link member 7 with the steering knuckle 1, ie., the ball joint 11, is located on the axis of the link member 6 in a plan view. In other words, the cross point P is located on the axis of the link member 7 in a plan view when the front wheel W is in the neutral position.

Thus, the cross point P moves to the outside of the vehicle when the front wheel W is turned from the neutral position to the outward direction (P_0 to P_1), and also it moves to the outside of the vehicle when the front wheel W is turned from the neutral position to the inward direction (P_0 to P_2).

As a result, the kingpin offset δ , as denoted by a line B in Figure 5, is within a positive value wherein the cross point between the kingpin axis KL and the ground lies inside of the cross point between the centerline CL of the front wheel W and the ground in relation to the transverse direction of the vehicle. The kingpin offset δ is minimized when the front wheel W is in the neutral position. When the front wheel W is turned to the inward direction or outward direction from the neutral position, the kingpin offset δ increases substantially at a quadratic curve.

In the aforementioned embodiments, the upper arm 2 comprises the two link members 6 and 7. The present invention is also effective when the lower arm 2 comprises two link members. In this case, the longitudinally disposed link member should be on the side of the cross point which is opposite to the side thereof in the aforementioned embodiments.

Claims

1. A suspension system for a vehicle comprising:
   a steering knuckle for supporting a wheel which is used for steering;
   an upper arm for connecting an upper portion of the steering knuckle to a frame of the vehicle;
   a lower arm for connecting a lower portion of the steering knuckle to a frame of the vehicle;
   at least one of said arms comprising two link members, each of said link members being pivotally connected to the frame of the vehicle at one end thereof and to the steering knuckle at an opposite end thereof;
   said link members being so disposed as to set a kingpin offset at a positive value wherein a cross point between the kingpin axis and the ground is located inside of a center of a contact surface between the wheel and the ground in relation to a transverse direction of the vehicle, and increase the kingpin offset as the wheel is turned toward an outward direction wherein the wheel is located radially outwardly in relation to a turning circle.

2. A suspension system for a vehicle comprising:
   a steering knuckle for supporting a wheel which is used for steering;
   an upper arm for connecting an upper portion of the steering knuckle to a frame of the vehicle;
   a lower arm for connecting a lower portion of the steering knuckle to a frame of the vehicle;
   at least one of said arms comprising two link members, each of said link members being pivotally connected to the frame of the vehicle at one end thereof and to the steering knuckle at an opposite end thereof;
   said link members being so disposed as to set a kingpin offset at a positive value wherein a cross point between the kingpin axis and the ground is located inside of a center of a contact surface between the wheel and the ground in relation to a transverse direction of the vehicle, and increase the kingpin offset as the wheel is turned toward an inward direction wherein the wheel is located radially inwardly in relation to a turning circle as well as an outward direction wherein the wheel is located radially outwardly in relation to the turning circle.

3. A suspension system for a vehicle comprising:
   a steering knuckle for supporting a wheel which is used for steering;
   an upper arm for connecting an upper portion of the steering knuckle to a frame of the vehicle;
   a lower arm for connecting a lower portion of the steering knuckle to a frame of the vehicle;
   at least one of said arms comprising two link members, each of said link members being pivotally connected to the frame of the vehicle at one end thereof and to the steering knuckle at an opposite end thereof;
   said link members being so disposed as to set a kingpin offset at a positive value wherein a cross point between the kingpin axis and the ground is located inside of a center of a contact surface between the wheel and the ground in relation to a transverse direction of the vehicle, and minimize the kingpin offset when the wheel is turned at a predetermined angle toward an inward direction wherein the wheel is located radially inwardly in relation to a turning circle.

4. A suspension system for a vehicle in accordance with claim 1, wherein:
   said upper arm comprises said two link members;
   one of the link members being disposed in a transverse direction;
   the other link member being disposed in a longitudinal direction;
   the two link members being disposed such that an extended portion of an axis of the longitudinally disposed link member crosses an axis of the transversely disposed link member in a plan view of the disposition of the link members; and,
   the longitudinally disposed link member being located to the rear of the cross point.

5. A suspension system for a vehicle in accordance with claim 1, wherein:
   said lower arm comprises said two link members;
   one of the link members being disposed in a transverse direction;
   the other link member being disposed in a longitudinal direction;
   the two link members being disposed such

that an extended portion of an axis of the longitudinally disposed link member crosses an axis of the transversely disposed link member in a plan view of the disposition of the link members; and,

the longitudinally disposed link member being located in front of the cross point.

6. A suspension system for a vehicle in accordance with claim 1, wherein:

said upper arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed in a longitudinal direction;

the two link members being disposed such that a portion of an axis of the transversely disposed link member extended to an outside of the vehicle crosses an axis of the longitudinally disposed link member in a plan view of the disposition of the link members; and,

the longitudinally disposed link member being located in front of the cross point.

7. A suspension system for a vehicle in accordance with claim 1, wherein:

said lower arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed in a longitudinal direction;

the two link members being disposed such that a portion of an axis of the transversely disposed link member extended to an outside of the vehicle crosses an axis of the longitudinally disposed link member in a plan view of the disposition of the link members; and,

the longitudinally disposed link member being located to the rear of the cross point.

8. A suspension system for a vehicle in accordance with claim 1, wherein:

said upper arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed obliquely in a longitudinal direction;

the two link members being disposed such that a portion of an axis of the transversely disposed link member extended to an outside of the vehicle crosses a portion of an axis of the longitudinally and obliquely disposed link member extended to the outside of the vehicle in a plan view of the disposition of the link members; and,

the longitudinally and obliquely disposed link member being located to the rear of the cross point.

9. A suspension system for a vehicle in accordance with claim 1, wherein:

said lower arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed obliquely in a longitudinal direction;

the two link members being disposed such that a portion of an axis of the transversely disposed link member extended to an outside of the vehicle crosses a portion of an axis of the longitudinally and obliquely disposed link member extended to the outside of the vehicle in a plan view of the disposition of the link members; and,

the longitudinally and obliquely disposed link member being located in front of the cross point.

10. A suspension system for a vehicle in accordance with claim 1, wherein:

said upper arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed in a longitudinal direction;

the two link members being disposed such that, in a neutral position of the wheel, a connection point of the longitudinally disposed link member with the steering knuckle is located on an axis of the transversely disposed link member in a plan view of the disposition of the link members ; and,

the longitudinally disposed link member being located to the rear of the transversely disposed link member.

11. A suspension system for a vehicle in accordance with claim 1, wherein:

said lower arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed in a longitudinal direction;

the two link members being disposed such that, in a neutral position of the wheel, a connection point of the longitudinally disposed link member with the steering knuckle is located on an axis of the transversely disposed link member in a plan view of the disposition of the link members ; and,

the longitudinally disposed link member being located in front of the transversely disposed link member.

12. A suspension system for a vehicle in accordance with claim 2, wherein:

said upper arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed in a longitudinal direction;

the two link members being disposed such that, in a neutral position of the wheel, a connection point of the longitudinally disposed link member with the steering knuckle is located on an axis of the transversely disposed link member in a plan view of the disposition of the link members ; and,

the longitudinally disposed link member being located to the rear of the transversely disposed link member.

13. A suspension system for a vehicle in accordance with claim 2, wherein:

said lower arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed in a longitudinal direction;

the two link members being disposed such that, in a neutral position of the wheel, a connection point of the longitudinally disposed link member with the steering knuckle is located on an axis of the transversely disposed link member in a plan view of the disposition of the link members ; and,

the longitudinally disposed link member being located in front of the transversely disposed link member.

14. A suspension system for a vehicle in accordance with claim 3, wherein:

said upper arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed in a longitudinal direction;

the two link members being disposed such that an extended portion of an axis of the longitudinally disposed link member crosses an axis of the transversely disposed link member in a plan view of the disposition of the link members;

the longitudinally disposed link member being located to the rear of the cross point; and,

a connection point of the longitudinally disposed link member with the steering knuckle overlapping the axis of the transversely disposed link member in the plan view of the disposition of the link members when the wheel is turned at a predetermined angle toward an inward direction wherein the wheel is located radially inwardly in relation to a turning circle.

15. A suspension system for a vehicle in accordance with claim 3, wherein:

said lower arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed in a longitudinal direction;

the two link members being disposed such that an extended portion of an axis of the longitudinally disposed link member crosses an axis of the transversely disposed link member in a plan view of the disposition of the link members;

the longitudinally disposed link member being located in front of the cross point; and,

a connection point of the longitudinally disposed link member with the steering knuckle overlapping the axis of the transversely disposed link member in the plan view of the disposition of the link members when the wheel is turned at a predetermined angle toward an inward direction wherein the wheel is located radially inwardly in relation to a turning circle.

16. A suspension system for a vehicle in accordance with claim 3, wherein:

said upper arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed in a longitudinal direction;

the two link members being disposed such that a portion of an axis of the transversely disposed link member extended to an outside of the vehicle crosses an axis of the longitudinally disposed link member in a plan view of the disposition of the link members;

the longitudinally disposed link member being located in front of the cross point; and,

a connection point of the transversely disposed link member with the steering knuckle overlapping the axis of the longitudinally disposed link member in the plan view of the disposition of the link members when the

wheel is turned at a predetermined angle toward an inward direction wherein the wheel is located radially inwardly in relation to a turning circle.

17. A suspension system for a vehicle in accordance with claim 3, wherein:

said lower arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed in a longitudinal direction;

the two link members being disposed such that a portion of an axis of the transversely disposed link member extended to an outside of the vehicle crosses an axis of the longitudinally disposed link member in a plan view of the disposition of the link members;

the longitudinally disposed link member being located to the rear of the cross point; and,

a connection point of the transversely disposed link member with the steering knuckle overlapping the axis of the longitudinally disposed link member in the plan view of the disposition of the link members when the wheel is turned at a predetermined angle toward an inward direction wherein the wheel is located radially inwardly in relation to a turning circle.

18. An suspension system for a vehicle in accordance with claim 3, wherein:

said upper arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed obliquely in a longitudinal direction;

the two link members being disposed such that a portion of an axis of the transversely disposed link member extended to an outside of the vehicle crosses a portion of an axis of the longitudinally and obliquely disposed link member extended to the outside of the vehicle in a plan view of the disposition of the link members;

the longitudinally and obliquely disposed link member being located to the rear of the cross point; and,

a connection point of the longitudinally and obliquely disposed link member with the steering knuckle overlapping the axis of the transversely disposed link member in the plan view of the disposition of the link members when the wheel is turned at a predetermined angle toward an inward direction wherein the wheel is located radially inwardly in relation to a turning circle.

19. A suspension system for a vehicle in accordance with claim 3, wherein:

said lower arm comprises said two link members;

one of the link members being disposed in a transverse direction;

the other link member being disposed obliquely in a longitudinal direction;

the two link members being disposed such that a portion of an axis of the transversely disposed link member extended to an outside of the vehicle crosses a portion of an axis of the longitudinally and obliquely disposed link member extended to the outside of the vehicle in a plan view of the disposition of the link members;

the longitudinally and obliquely disposed link member being located in front of the cross point; and,

a connection point of the longitudinally and obliquely disposed link member with the steering knuckle overlapping the axis of the transversely disposed link member in the plan view of the disposition of the link members when the wheel is turned at a predetermined angle toward an inward direction wherein the wheel is located radially inwardly in relation to a turning circle.

FIG. 1

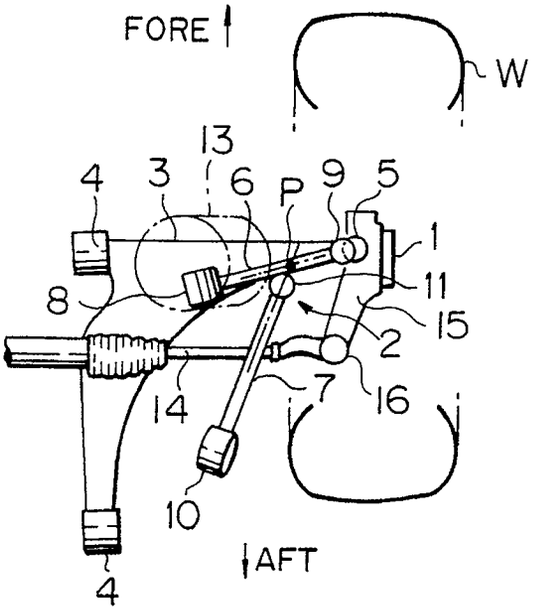
FORE
W
13
4
3
6
P
9
5
1
11
8
15
2
14
7
16
10
AFT
4

FIG. 2

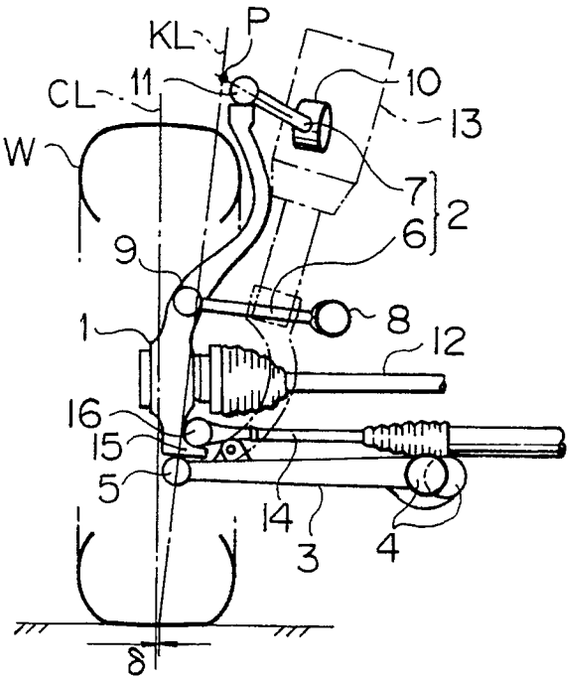
KL
P
CL
11
10
13
W
7
2
6
9
1
8
12
16
15
5
14
3
4
δ

FIG. 3

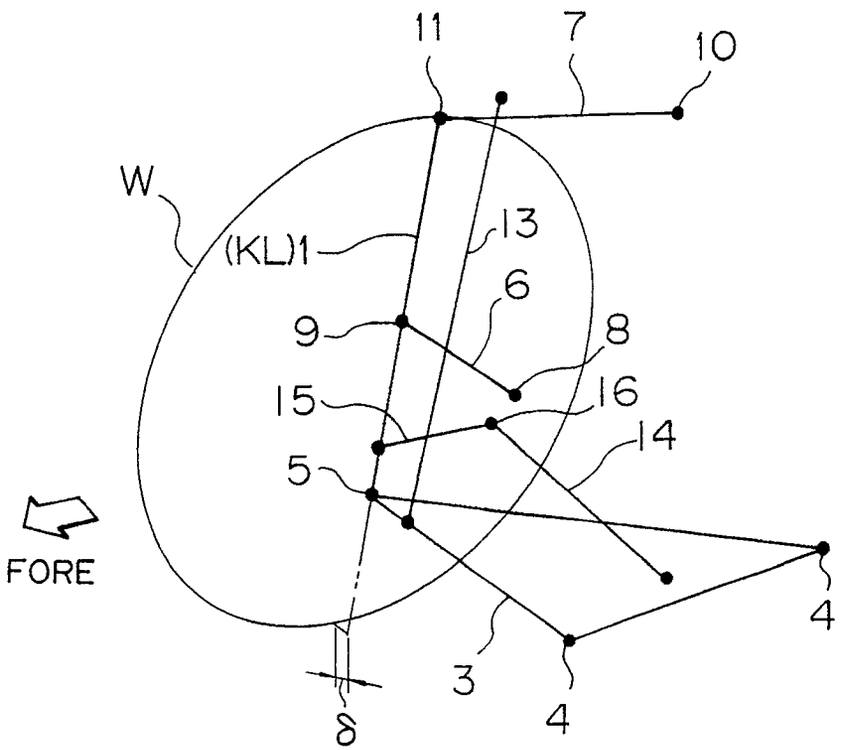

FIG. 4

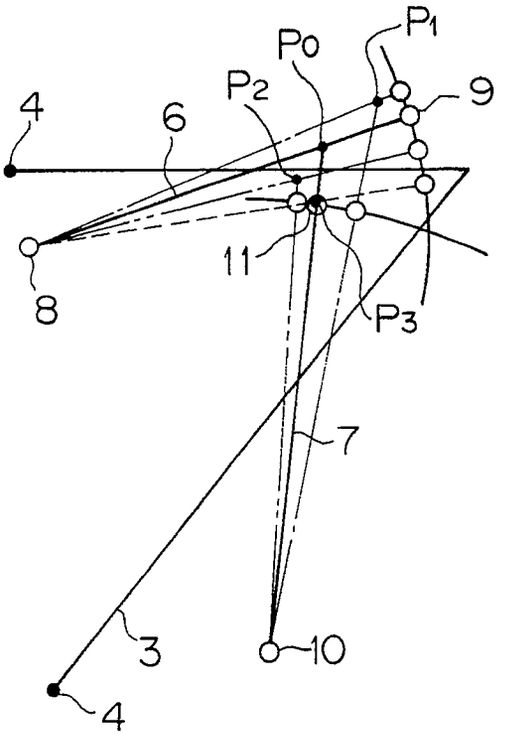

FIG. 6

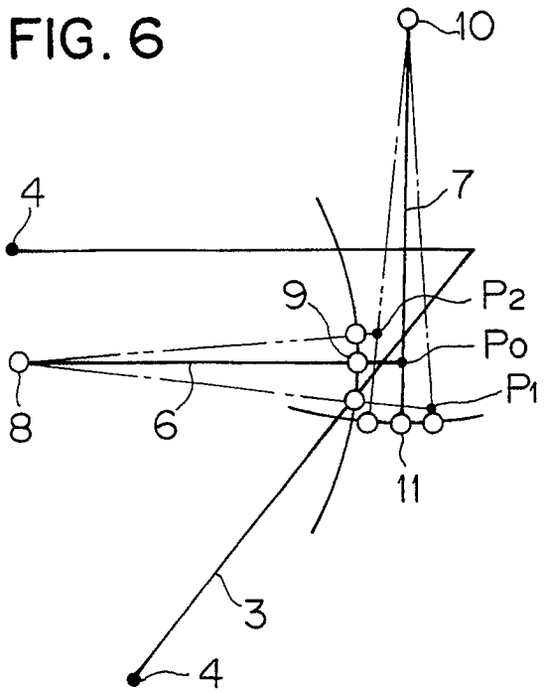

FIG. 5

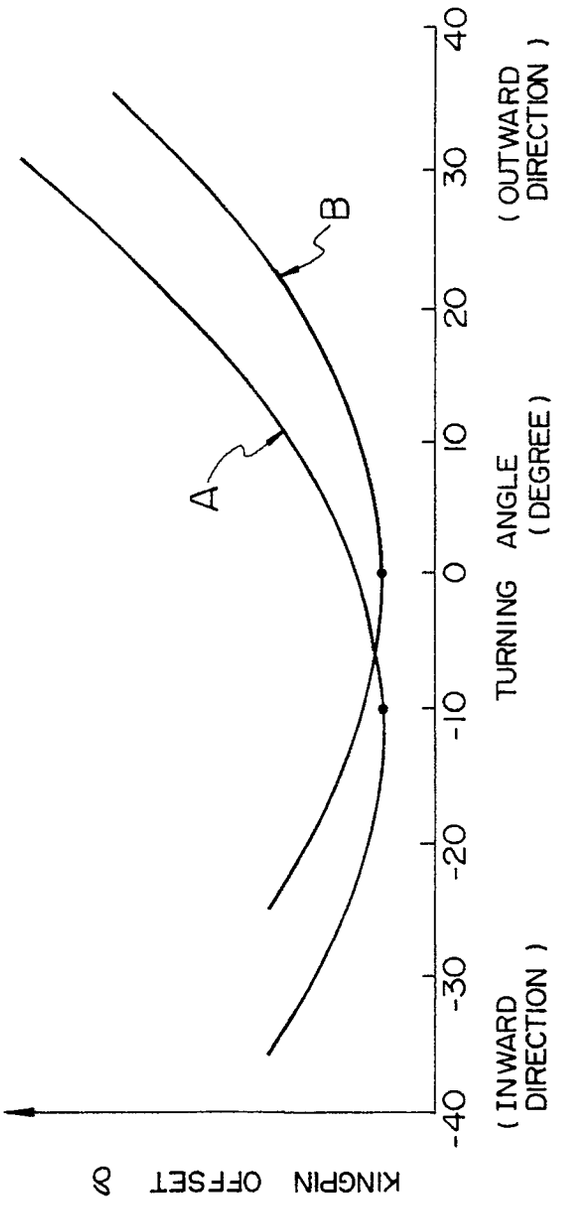
KINGPIN OFFSET δ
-40
-30
-20
-10
0
10
20
30
40
TURNING ANGLE (DEGREE)
(INWARD DIRECTION)
(OUTWARD DIRECTION)
A
B

FIG. 7

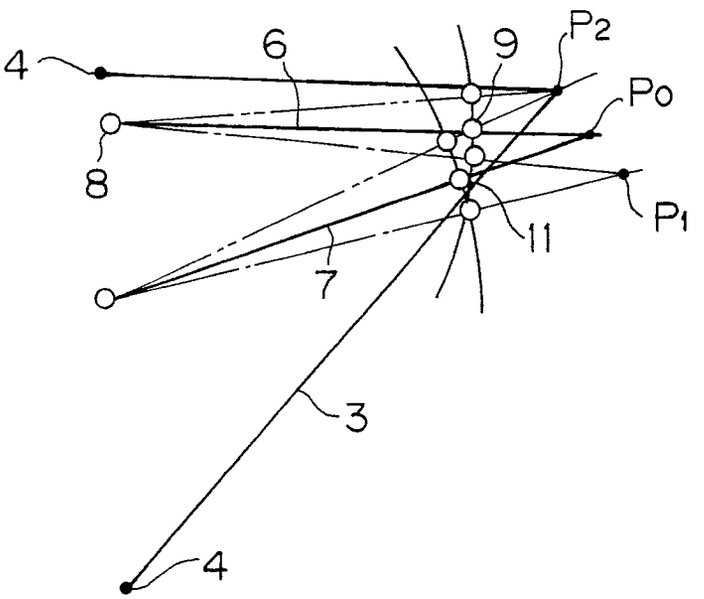

FIG. 8